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streams occasionally and temporarily filled with water became corn-fields which yielded bountiful returns to the Indian agriculturist. These regions gave the surplus which is necessary for the building of an advanced civilization and here rather than in the favorable subenvironments arose the true agriculture of cereals, on which basis the civilizations of the world now rest.

The environment determined largely the methods of application of water to land. North of the great ridge which crosses the southern portions of Arizona and New Mexico, forming the watershed of the Gila-Salt River, are found the more primitive methods of irrigation, that is by simple canals diverting water from streams to the nearest land and by warping or spreading by means of slight temporary barriers a fan of water from a point in the stream where the bank and bed of the stream are at a uniform level. South of the ridge which absorbs the cloud moisture and diverts it into the Gila is found a more complicated system in the trunk and lateral canals of great extent employed by the Indians who inhabited this region. Here the rivers lent themselves to irrigation and the agricultural tribes were led to employ the facilities to their betterment.

The somatology and culture of the Pueblo Indians in ancient times are known to have presented a remarkable uniformity, and here may be found an argument for the compelling, panurgic force of the environment. Time and isolation must be considered as concomitant factors in the formation of a Pueblo type under the peculiar transforming character of the environment, which, while it produced uniformity in many respects, may have tended to perpetuate the five language stocks that prevail in the region.

The most obvious effects of Pueblo environment are those connected with irrigation, architecture, arts and religion, and in

the last the fullest sway of its causation is shown.

Without doubt the following of these and other lines of inquiry relating to the habits and customs of the Pueblo Indians will be productive of valuable material on this subject, necessarily but sketched in this communication.

WALTER HOUGH.

NATHANIEL SOUTHGATE SHALER.¹

IN ever-growing measure for over forty years, Nathaniel Southgate Shaler made himself part of our life and gave the service of an intensely active personality to the college and the country.

He had an unusual range of experience in contact with the world of men and work: a boy in a slave-holding community, a young officer of the Union army in the civil war, later the director of a survey in his native state and member of various commissions in the state of his adoption, practised field geologist in many parts of this country, observant traveler abroad, expert in two bureaus of the national government, adviser of mining enterprises in the south and west, writer in many fields, orator and poet on our days of celebration, he thus gained that wide acquaintance with external affairs which made him so invaluable a Harvard man: student at eighteen, lecturer at twenty-three, professor at twenty-seven and dean at fifty.

He was impatient of seclusion in his work, and therefore related himself, but without a trace of self-seeking intrusion, to all phases of university life. Confident and courageous, abounding in initiative, he gave direction to work around him and turned the course of events. Inventive and independent, strikingly individualized, he worked to best advantage as a leader or alone, not as one of two; if other names

¹ Minute adopted by the Faculty of Arts and Sciences of Harvard University.

have occasionally been linked with his, the association showed his generosity rather than his need.

He was always devoted to the development of his own department, which grew and flourished under his leadership; he foresaw success for other departments which came into existence under his fostering care; he made the summer months educationally useful as they had never been before; he brought new life into an old school, and he inspired and guided the creation of a new and greater school to be, of which he was marked for the first officer. So wide a distribution of academic interests might well have weakened the efficiency of a less active man; but he was vigilant and faithful even to the details of his varied administrations; discerning and cautious in action where risks were great, yet ever ready to essay new methods and bold in taking risks where judgment advised a venture; unceasingly alert in his endeavors for the betterment of all our work; untiringly ingenious in the invention of new devices for enriching the opportunities of the university and for extending the influence of learning; cheerfully assured that, however great the task to be done, strength would always be found to do it.

While he was indifferent to the conventions of fashion and to whatever seemed to him hollow or excessive in forms or ceremonies, he was sincerely courteous in manner, and he therefore carefully retained some formalities in daily intercourse which others have carelessly abandoned. He was simple in his tastes, and his house and household were simply and genuinely hospitable. It was as much his courtesy as his appreciation of good business methods that made him punctilious in keeping all appointments. He was unaffectedly, unconsciously original and picturesque in bearing and in speech; to the end a staunch Kentuckian, though citizen of another com-

monwealth for nearly half a century. He was outgoing in his relations alike with friends and with strangers, seldom waiting for others to make advances, yet unreservedly responsive if they did; valuing the enlivenment of ideas that springs from free discussion and the mental exhilaration that comes of hearty laughter in good company, and always finding the good in any company that he met; possessed of a retentive memory that brought pertinent events from the crowded past, fresh and glowing, into the service of the present; fond of reminiscence thus abundantly supplied, and of citing the bearing of former adventures on the case just now in hand, but this in the most natural manner, without conceit or selfishness, and therefore always entertaining to his listeners, who never failed to make him the center of their group.

Beyond his university duties he had a keen sense for outside business affairs, and his advice was often sought by practical men on practical matters. He was more mindful of his civic duties than most of us are, and well known to his fellow townsmen of all stations, who did not fail to testify in fitting manner to this exceptional departure from the unintentional reserve of absorbed professors.

He was a good judge of men, for he had scrutinized many members of his vast acquaintance; he was loyal, encouraging and trustful with his associates, a lover of every reasonable liberty of individual judgment and conduct, and serviceable to many of us through his broad sympathy, his helpful suggestions and his interested inquiries. He was vigorous, even vehement, in the outspoken expression of his opinions, sometimes overriding his opponent with confident assertion—'traversing,' he used to call it—but expecting as frank and direct treatment in return. To the open antagonist he showed respect, even when most engaged in controversy, and a warm gener-

osity which outlasted many a sharp difference, for he wished to be fair-minded even when most a partisan. He was displeased with unspoken opposition, and affronted by circuitous methods, denouncing in unmeasured terms what seemed to him the unfair indirection of certain legal and political devices.

How warm was his greeting to old friends, on meeting them again; how hearty his welcome to the newcomer, whether colleague, student or passing stranger. No one here had more numerous or more beneficent personal relations with all sorts of persons, within and without the university. He had an intense fondness for young men, and took every opportunity of aiding them to idealize their lives, for he was genuinely solicitous for their welfare. He gave his time freely to consider the case of each student who applied to him for counsel, always preferring to act on the basis of individual judgment rather than under the guidance of rule or precedent. He was deeply sympathetic towards all sufferers, and made it his own affair to succor and relieve them. Yet he was unsparing, even scathing, in his condemnation of those whose conduct seemed to him dishonorable.

One might have thought, in view of his plans and committees for the reception of new students at the beginning of the year, and in view of his welcome for them at his house all the year round, that to make Harvard more hospitable was his chief aim, were it not remembered at once that he had many chief aims; for besides his extraordinary power of engaging effectively in an uncommon variety of practical tasks which drew largely on his day's work, he had an eager and watchful interest in the scientific study of the facts and processes of nature, regarding which he was always a thoughtful observer, an independent inquirer and a most ingeniously speculative theorizer. Thus at once naturalist and humanist, he

exemplified the wider interests of an earlier time, before specialization had been forced upon us. Yet with all the diversity of his activities, he loved the unity of science as he loved the unification of university work. It was largely from the point of unity and continuity that he revealed the order of nature to the thousands of students who attended his lectures these many years; the interaction of the sun, winds, oceans, lands and life being the main theme in his presentation of geology, while his treatment of paleontology was directed to describing the ancient forms of life, not merely for themselves, but as the ancestors of the present inhabitants of the earth. He never limited his attention closely to one line of inquiry, but was always keenly interested in a wide variety of natural and human phenomena; and one sign of this was the manner in which he would consult his colleagues on unexpected topics. He was especially fond of tracing the connections which bind together the various regions of knowledge, showing at once the naturalist's love of detail and the philosopher's fondness for large problems.

Truth in matters of science attracted him for much the same reason that made him love fidelity of conduct; for through both the individual human life is kept in closer touch with the life of the universe. He loved to dwell on whatever showed that human nature is deep-rooted in universal nature, the outcome of a long process of evolution. Those who gained the great privilege of close acquaintance with him found, beneath a thousand other things, a deep reverence for humanity, and learned that a great zeal for the dignity and elevation of his fellow men was the center of his life. It seems strange that a man so strongly imbued with a feeling for others as to have been the center of a warm affection in his wide circle of friends, so effective in reaching others as to have impressed

his personality on college and community more profoundly than any Harvard teacher of his generation, should have sometimes been overcome by the hopelessness of trying to express one's personality at all. This but reveals the delicate elements of his inmost character; a warmth of emotion hardly to be expected of one prevaillingly so cheerful, a sensitiveness to misunderstandings and estrangements hardly to be looked for in so aggressive a man. These qualities only made him the more humane in his dealings, and led him to set a higher value on whatever might help towards sympathy and mutual knowledge. Hence he urged the deliberate study of men all through the gamut of human qualities, from those who are held in prisons to those who dwell in palaces; for he knew the profit as well as the difficulty of such study, and he regretted that the segregating action of a highly developed social order should require men commonly to know only those who are of about their own grade. "Personally," he wrote, "I value what I have been so fortunate as to gain of acquaintance with very diverse sorts of men more highly than all else that I have won in the way of knowledge." That is a summary of Shaler's life-work in his own words. It is a happiness to know that he thus valued what he gained from others, for so we all, officers, students and friends of the university, and countless others in the great outer world besides, may feel that we made some return for the great gain that we have had in knowing him.

SCIENTIFIC BOOKS.

Dr. J. Frick's Physical Technique. Seventh edition. By Dr. OTTO LEHMANN. Vieweg, Brunswick. 1905. Vol. I., Part II.

This publication completes Volume I. of the seventh edition of this well-known work, the first part of which was reviewed in this magazine (Volume XX., p. 670, 1904). This

second part of the first volume contains exactly 1,000 pages and is enriched by nearly 2,000 illustrations.

The first part of this first volume was devoted largely to a description of the necessary equipment of a physical laboratory, together with a description in detail of various technical processes such as soldering, glass blowing, construction of delicate apparatus, etc. This second part begins with an 'introduction to physical demonstrations,' which is followed by twelve chapters devoted to the various subdivisions of mechanics and heat.

In the introduction the author begins by stating what he considers to be the object of physics, and by describing the method followed by him in presenting the matter to his classes. The first subject treated, therefore, is that of forces, which is followed by a description of the meaning of units of length, time and mass, each of these being accompanied by rather elaborate descriptions of the best methods of making measurements. Without going into details, it may be interesting to state the order in which the subjects of physics are taken up. These are as follows: statics, solid bodies, hydrostatics, fluids, aerostatics, gases, temperature, quantity of heat, dynamics, hydrodynamics, aerodynamics, thermodynamics. Under the head of each of these, lecture experiments are described in full, which are designed to illustrate the varied phenomena and at the same time to enable measurements of the various quantities to be made on a large scale before the classes. The author attempts to give in each case information concerning the experiments and apparatus, so that, if a laboratory is not equipped with the apparatus as furnished by the large commercial houses, it is possible for the instructor himself to make simple and accurate apparatus. In some respects the book is a most admirable text-book for classes, and no one can read it without gaining much information in regard to both the theoretical and the practical side of the subject.

One has only words of praise to say of the object of the work, of the manner in which this has been carried out by the author, and of the admirable spirit in which the publisher